

Ten Steps to Zero

Saving Ourselves and Our Money
Too

Premises

- No difference between “air pollutants” and “greenhouse gases”—all wastes kill, injure and alter climate
- Prudent approach is simultaneous, proportional reductions and all pollutants, which produces negative costs, reduces all threats

Sector by Sector Analysis

- Residential and Commercial
- Industry
- Electricity Generation
 - Renewables
 - Fossil
- Transportation Technologies
- Transportation Non-Technology

Analysts

- David Goldstein, NRDC
- Ernst Worrell, LBL
- George Sterzinger, REPP
- Jo Anne Aplet, JA Associates
- Michael P. Walsh, Legend
- Alberto Ayala, CARB
- Paul Guthrie, formerly of ICF
- Curtis Moore

Why Zero?

- Because zero is the only assuredly safe level of air pollution.
- Because it is technologically achievable.
- Because it eliminates slippage
- Because money- economics – should help us decide *how* to solve a problem, *not whether*.
- Because the risk of climate cataclysm is is small, but real

Why Ten Steps

- Because we have—
 - Ten Amendments
 - Ten commandments
 - Ten dimes to a dollar
- It's a Nice, Round Number
- Most importantly, it is a commitment

What Are the Ten Steps

- Non-technology transport measures
- Conservation
- Industrial Measures
- Worst p/p to wind
- Switch remaining p/p to cleaner fossil
- Adopt non-zero vehicle technologies
- Phase in zero-pollution m/v technologies
- Adopt renewables w/ retirements
- Switch industries to renewable sources
- Adopt zero m/v w/ fleet turnover

Examples of Existing Technologies and Practices

Remember—All are currently
Available

Electricity Generation

- Coal-fired generation: switch to integrated gasification-combined cycle (“Cool Water”)
- Natural gas: switch to low-NOx turbines (Siemens), operating in combined cycle
- Utilize waste heat (cogeneration or tri-generation)
- Switch to wind power

Transport Technology Options

- Engine, transmission and other technologies
- Hybrid propulsion systems
- Alternative fuels
 - CNG, LNG especially for heavy duty vehicles
 - Electricity, though ZEV program is now moribund, having produced a 120 mile-per-gallon

Technology Transport: Reviving ZEVs

- Large ZEVs use same technology as small ZEVs. Therefore, mandate—
- ZEV school and urban buses: 10 % in 2010
◇ 25% 2030
- ZEV taxis: 2 % in 2010 ◇ 22 % in 2030
- ZEV delivery trucks: 2 % in 2010 ◇ 22 %
in 2030

Reviving ZEVs (cont'd)

- Start replacement of light duty vehicles with ZEVs starting in 2014
- Increase 10 % per annum to 2023
- 2024 and beyond, ZEVs = 100 % of new LDV sales.

Non-Technology Transport

- Alter Land Use Patterns (Portland vs. Atlanta)
- Internalize Costs (London congestion fee)
- Traffic Management (HOV lanes, timed lights, etc.)
- Increase Public Transit Use (Esp. Bus Rapid Transit from Curitiba, Bogota, etc.)

Industry

- Blended Cement (100 % of Dutch concrete)
- Cogeneration
- High efficiency motors
- Process management (“pinch analysis”)
- Improved steam generation (boilers) and distribution

Commercial and Residential

- Lighting (T-8s w/ improved ballasts)
- Optimized motors & drives
- HVAC (SEER 10 \diamond 15)
- Computers, etc.: kill “vampires”
- White “cool roofs”
- Distributed generation

Results at Year Five

- Commercial and Residential: - 47.5 percent electricity consumption
- Industrial: - 37 percent CO₂, virtual elimination of CH₄
- Electricity
 - Worst quintile to Class 5 and 6 wind, landfill gas

Results (cont'd)

Switch to wind (cont'd)

- NO_x -52%
- SO₂ -97%
- CO₂ -23%

- Switch remainder to combined cycle

- NO_x -25%
- SO₂ -30%
- CO₂ -22%

Results (cont'd)

- Switch coal-by-wire to IGCC
 - NO_x -75
 - SO₂ -99
 - CO₂ -25
- All of the above is without combined heat and power

Results (cont'd)

- Switch to zero-sulfur fuel
 - CH₄ -25% Transport
 - N₂O -70% Transport
 - CO₂ - 4% Transport
- Adopt non-tech transport
 - Congestion Charging -12% Transport CO₂
 - Bus Rapid Transit -18% Transport CO₂
 - Smart Growth - 9% CO₂ = 39%

Year 5 Results

- Very, very close to Governor's pledge of a 50 percent reduction in air pollution
- Most measures have negative monetary cost
- Groundwork laid for zero air pollution by 2035

After Year Five

- Start bus ZEV mandate
 - 1 % p/a bus ZEVs in year 1
 - 2 % p/a in year 11
 - 3% in year 16
 - 5% in year 21
 - 10 % in year 26

After Year 5

- Start light duty, medium duty delivery and taxi ZEVs—
 - in year 5 at 1% per annum
- Start light duty ZEVs
 - In year 9 at 10% per annum
 - Complete fleet turnover in year 29

After Year 5

- Electricity: retirement completed at end of year 29.
- Industrial: switch to renewables completed at year 29.
- Commercial and residential: switch to renewables completed by year 29.
- Year 30: zero air pollution

Is Zero Air Pollution Possible?

Yes. The technologies exist today.

Is Zero Pollution Economically Feasible?

Yes, but economists have monetized the Earth, and it's not worth what it would cost to save it.

Conclusion

A solitary human, hunched on coral rubble atop what was an island 50 years ago.